Notice of Allowability	Application No.	Applicant(s)	
	09/869,614	NIEUWKAMP, WOLFGANG	
	Examiner	Art Unit	
	David A. Rogers	2856	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *27 February 2004*.

2. ☒ The allowed claim(s) is/are *52-62*.

3. ☒ The drawings filed on *29 June 2001* are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Adam Cox on 15 April 2004. The application has been amended as follows:

Replace paragraph 0001 with the following:

(0001) The invention relates to a measuring system for the monitoring of residual dust for safety vacuum cleaners.

Replace paragraphs 0005 - 0007 with the following:

(0005) DE-GM 92 O9 407.4 discloses a detection device of filter breakage in vacuum cleaner arrangements, which device uses the principle of infrared radiation reflection for the particle measurement in the exhaust air. In the exhaust air channel of a vacuum cleaner arrangement there are arranged an infrared sender and an appertaining infrared receiver angularly offset to one another on the circumference of the exhaust air channel, long-wave energy being radiated into the exhaust air channel by the infrared sender. This infrared radiation is then partly reflected on the dirt particles flowing through in such manner that the reflection radiation is registered over the infrared receiver offset, for example, by 90^0 to the infrared sender.

(0006) The energy supplying and the measuring signal preparation occurs in an evaluating electronic system connected with the sender and

receiver. The measuring field is defined by the overlapping of the respective input and output jet cone.

(0007) On concentration rise of the dust particles in the exhaust air channel the IR energy irradiated by the sender is reflected (amplified) on the particles and measured in the receiver and in this manner a threshold value preset in the evaluating electronic system can be overstepped, which threshold value triggers an alarm and/or brings the motor to a standstill. In this manner, a filter breakage is measured and displayed, in order to avoid health-threatening particle emissions into the environmental air, by manual or automatic switching off of the suction motor, and to make possible a filter change in proper time.

Replace paragraphs 0009 and 0010 with the following:

(0009) A further disadvantage of the measuring principle with infrared radiation reflection for residual dust particle measurement is that measurement is restricted to the focusing range of the sender/receiver, i.e., the measurement field defined by the overlapping of the radiation cones of sender and receiver does not cover the entire cross-section of the outlet tube, whereby outside of the measuring field no particle measurement takes place, which likewise leads to an undefined, poorly compensatable falsification of the measurement signal.

(0010) The purpose for this invention, therefore, is to provide a measuring system for residual dust monitoring in safety vacuum cleaners in such manner that the above-mentioned disadvantages of the state of the art are reduced or even eliminated. Specifically, it is found that the measuring system is more sturdy resulting in a more dependable construction. It is also found that the system provides more

accurate measurements in the case of low particle concentration in the exhaust air.

Replace paragraphs 0012 - 0015 with the following:

(0012) For the solution of the problem posed there serves the technical teaching of the present invention.

(0013) An essential feature is that, according to the invention, the measuring system of the residual dust monitoring in safety vacuum cleaners provides for at least one measuring electrode mounted upstream behind the filter unit. The measuring element transmits a current signal to a measurement value processing unit. The current signal is produced by contact tension between measuring electrode and particles and depends on the particle concentration.

(0014) There arises here a contact voltage through intensive contact of the dust particles carried along in the carrier medium (air) with the material of the measuring electrode. If the dust particles consist of a material which is materially different from the material of the measuring electrode, then there occurs a passing-over of electrons which flow off to the lower potential as a function of the contacting particles and therewith of the particle concentration in the exhaust air. This holds for both electrically conducting particles and electrically insulating particles. With electrically conducting particles the cause of the charge separation lies in the differing emergence work in comparison to the measuring electrode, and with electrically insulating particles the charge separation lies in the different electron affinity in comparison to the measuring electrodes.

(0015) In a preferred form of execution of the measuring system for residual dust monitoring for safety vacuum cleaners according to the

invention, it is provided that at least one measuring electrode is arranged downstream within the outlet tube behind the filter and behind the turbine, preferably in the end zone of the outlet tube. Also, it must be possible to arrange the measuring electrode in the vicinity of the turbine in the outlet tube or in the motor block of the turbine itself.

Replace paragraph 0020 with the following:

(0020) The grid-form measuring electrode can be bounded by an annular element around the mantle surface, in which case preferably the annular element consists of the same material as the measuring electrode. It can, however, also consist of flexible plastic, into which the measuring electrode is cast and is thrust with clamping effect into the outlet tube. The fixing into position of the measuring electrode can occur over a releasable or unreleasable connection. It is preferred, however, that the fixing is over a releasable screw, a rest or clamping connection, or a welding connection.

Replace paragraphs 0022 - 0024 with the following:

(0022) If the measuring electrode lies directly on the filter outlet surface or in its vicinity, then it has about the same form as the filter. Therefore, for example, a cylindrical/tubular form or disk form can be joined with the filter on its face side and/or mantle surface.

(0023) Several grid-type measuring electrodes can be provided, which again transmit their measuring signal to a measuring value processor. Here there can also be measured information about the level of the particle concentration, the distribution of the particle concentration over the cross-section of the outlet tube, and therewith the position of the filter defect can be determined. This holds, of course, only for a measuring electrode that is located between filter and turbine, since the

particles in the turbine substantially change their flow path, so that a correlation between measuring point and particle concentration behind the turbine or also in the vicinity in front of it is no longer possible.

(0024) Through the fact that the dust particles can be charged in a certain manner before their contact with the measuring electrode already in the inlet channel, in the dust chamber (housing), in their passage through the filter and the turbine and in the outlet channel, the dust particles are preferably discharged before contact with the measuring electrode in order to minimize measurement value falsifications.

Replace paragraph 0028 with the following:

(0028) Under the above-mentioned protection requirements there are to be understood contact and foreign-body protection, water protection and explosion protection, in which context there fall under explosion protection both the use of the apparatus in a danger zone (for example tank location zone), and also the use of the apparatus with hazardous substances (for example drawing-off of explosive gases and fluids).

Replace paragraph 0033 with the following:

(0033) This operation amplifier, microchip or microprocessor can then be connected over a usual interface with a personal computer or another data processing apparatus in order to coordinate measuring, control and regulating problems or in order to read out from the storage unit of the microchip or of the microprocessor, for example for statistical purposes. There can also occur a calibration over the PC, in which the threshold values for the further processing of the measurement signal are input, such as for example triggering of the alarm or switching on and off of the turbine.

Replace paragraph 0035 with the following:

(0035) The present invention is intended to detect an ever so slight filter leakage, but this measuring arrangement can also be used to detect, to display the blocking of the filter, to trigger optical or acoustic alarm, to turn off turbines automatically or by hand, or to modify the action of the suction stream on them, or to change filters automatically or by hand. If, therefore, the filter is blocked, then a predetermined threshold value of the measuring signal is undershot and again and optical and/or acoustic alarm signal can be given or the turbine motor can be shut off. In distinction to the turbine standstill, in which mo measurement signal is registered, with blocked filter and switched-on turbine a slight particle concentration is still measurable.

Replace paragraph 0045 with the following:

(0045) In Fig. 1 the measuring system of the invention for residual dust monitoring in safety vacuum cleaners is drawn exclusively schematically as a block circuit diagram, in order to explain the electrical wiring of the measuring electrode 11 and the manner of function of the entire safety vacuum cleaner in conjunction with the measuring system 10. It is obvious that the electronic components 12 of the measuring system 10 are mounted in a separate module or on the housing 1 of the safety vacuum cleaner, which module is HF-protected. The measuring electrode 11 itself is arranged here, representative of all other forms of execution, in the free end of the outlet channel 3. The turbine 5 with downstream-emplaced, rotationally symmetrical filter element 4 is sealed off on the housing 1 of the safety vacuum cleaner, the upper part of which is represented here in section.

Replace paragraphs 0048 and 0049 with the following:

(0048) In the turbine 5 the particles are then conveyed in the direction of the outlet channel 3, pass the zone of the measuring electrode and

leave again the safety vacuum cleaner in flow direction 9. In the normal case with unblocked and nondefective filter 4 only the smallest particles (depending on pore size of filter 4) emerge from the safety vacuum cleaner. With a defective filter 4 undesirably many particles in all orders of magnitude (depending on defect) emerge from the safety vacuum cleaner. With a blocked filter 4 virtually no particles emerge from the safety vacuum cleaner.

(0049) On contact of the particles with the grid-form measuring electrode, which extends over the entire cross-section of the outlet channel, the effect of the charge separation sets in as explained above, and over the measuring electrode there flows a measuring current stream "i" in the direction of the evaluating unit. This measuring current rises with increasing number of contacts of the particles with the grid-form measuring electrode and thus the measuring current reflects very accurately the number of particles in the exhaust air. By the homogeneous distribution of the grid-form measuring electrode over the entire cross-section of the outlet channel there is achieved a statistical averaging and accordingly the number of particles can be determined very accurately after a single calibration of the measuring system, although many of the particles, of course, pass through the measuring electrode without contact.

Replace paragraph 0051 with the following:

(0051) Since the measuring currents are only very small (a few nA), these must first be fed over an entry line 13, for example to a differential amplifier 12 and amplified to several mA in order to give a signal to a further evaluating unit. The second entry line 12 is connected here with the turbine housing 5 and lies on ground there or on artificial ground, depending on grounding of the turbine housing 5.

Replace paragraph 0053 with the following:

(0053) A measurement of the particle number can also occur continuously, in order then to use these measurement values statistically in an evaluating unit or a microprocessor and/or computer connected thereto.

Allowable Subject Matter

2. Claims 52-61 are allowed.

3. The following is an examiner's statement of reasons for allowance:

The prior art provides several examples of dust, dirt, particle, and moisture detection in vacuum cleaners. See United States Patents 3,674,316 and 4,175,892 to De brey where a diaphragm is used to detect particles; United States Patent 4,601,082 to Kurz where an optical device is used to detect particles; United States Patent 5,400,465 to Bosses *et al.* where a corona discharge device is used to charge all of the particles; and United States Patent Application Publication 2002/0042965 to Salem *et al.* where an electrode pair is used to detect moisture picked up by a vacuum cleaner.

The prior art of vacuum cleaners does not teach the sending of a signal based on the amount of particles in the airstream where the contact with an electrode by uncharged particles is used to indicate the amount.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Rogers whose telephone number is (571) 272-2205. The examiner can normally be reached on Monday - Friday (0730 - 1600).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron E. Williams can be reached on (571) 272-2208. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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